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NATIONAL BUREAU OF STANDARDS REPORT

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PROGRESS REPORT

ON

BONDING TO TREATED CONCRETE SURFACES

by

Winthrop C. Wolfe



U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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Organic Building Materials Section
Building Research Division

Sponsored by

Office of the Chief of Engineers
Department of the Air Force
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1. INTRODUCTION

Concrete floors have been treated with chemical "hardeners" for many years. Certain other treatments are a result of changes in practice in the trade. The most important of these changes is the substitution of membrane curing for the so-called "water cure" for concrete. Another kind of treatment of concrete is essential to a comparatively new type of construction known as lift-slab or tilt-slab.

Proper curing is required for a concrete slab to develop maximum strength and a desirable surface. A concrete floor or wall should be smooth, hard, and free from cracks or "dusting". If the surface is to be painted or covered with resilient floor covering, it is essential that paints or adhesives for floor coverings adhere to it. If a concrete floor has been allowed to dry from the surface before it has been properly cured, cracks are likely to develop and the surface may become "dusty". This will interfere with the application of paint or adhesives. Sometimes the surface of improperly cured concrete is improved by applying chemical "hardeners". These "hardeners" generally consist of water solutions of magnesium or zinc fluosilicate, sodium silicate, aluminum sulfate, or zinc sulfate. However, a properly finished and cured concrete slab made from the proper mix will have a satisfactory surface and the use of such "hardeners" will not be necessary.

The standard procedure for curing concrete has been the "water cure" and is simply to supply water for curing from the outside. This may be done by sprinkling, applying wet burlap, etc., or by "ponding". However, these procedures delay construction and require expensive labor. Also, it is desirable to conserve water, especially in arid sections. There is enough water already present in the concrete mix to effect curing by hydration of the cement; hence, present day construction practice is to seal in this water.

Water may be sealed in by means of waterproof paper, polyethylene film, or some other kind of waterproof sheet material. Another method which is growing in popularity is the "membrane curing" procedure, whereby a waterproof coating is applied to the moist concrete. This practice has been known for over twenty years and a number of commercial membrane curing agents are available.

In addition to chemical "hardening" and membrane curing, a concrete treatment of interest in this study is one essential to lift-slab and tilt-slab construction. This type of construction was devised about twelve years ago to save the expense of concrete forms. In lift-slab construction, upright steel I-beams are first set in footings about 30 or 40 feet apart. Special steel "collars" are placed around these steel columns to support the concrete slabs. The ground slab is poured in the normal manner and a liquid preparation is spread on the "green" concrete. This preparation acts as a membrane curing agent and also as a "parting agent" or "bond breaker". After the ground slab has cured a sufficient length of

time, another slab is poured directly over it to serve as the second floor. This second slab is treated in the same manner as the ground slab if other slabs are to be poured over it. In this manner, a multiple sandwich structure of as many as ten or more slabs is built up. Hydraulic lifting apparatus is connected to the steel "collars" in the top slab and it is slowly lifted into position to form the roof. The parting agent enables the separation of the top slab from the one beneath it. After lifting the slab into place, the steel collars are welded to the columns. The floor slabs are likewise lifted and welded in place. In tilt-slab construction, concrete slabs for walls are poured on the ground and then lifted in place. Parting agents are used to separate these from the ground slab. -

2. COMPATIBILITY OF TREATED CONCRETE SURFACES WITH RESILIENT FLOOR COVERINGS

The Asphalt and Vinyl Asbestos Tile Institute has expressed the opinion that failures in resilient flooring installations on concrete floors have been traced to membrane curing agents used on the floors. The Institute Technical Research Committee met with the Portland Cement Association in January 1961 to discuss the following problems encountered with resilient tile on concrete floors that had been treated with curing agents: adherence, oozing, softening of tile, and cupping of rubber tile. There have also been reports suggesting problems with resilient flooring which might be due to parting agents. Parting agents are compositions similar to certain types of curing agents and some preparations are advertised for both purposes. It should be realized that it is impossible to base conclusions solely on field observations. Field inspections should be backed up by laboratory research.

For example, a 4-story building in Rockville was constructed a little over a year ago by the lift-slab procedure. Thompson's Water Seal was used as the parting agent on the concrete slabs. About six months after the slabs were lifted, vinyl asbestos tile was laid in most of the building. Most of the tile was laid using asphalt emulsion adhesive, but some was put down with an asphalt cut-back type mastic. A few months after the tile was laid, asphalt mastic started to ooze through the seams. Some of the tile was removed and it was observed that the adhesive was soft underneath. Most of the adhesive was scraped off and new tile installed without using any more mastic. A few months later, mastic started to ooze between the seams of the new tile. Again the tile was removed, the wet mastic scraped off and new tile installed. A few months later, mastic was still oozing between the seams of the tile. It is known in the industry that certain "hot" plasticizers in vinyl asbestos tile will cause softening and oozing of the mastic. Also, the oozing might be due to the parting agent, Thompson's Water Seal. This is a subject for laboratory investigation.

On the other hand, a number of buildings were inspected which were known to have concrete floors treated with a product known as "West Concrete Floor Treatment", manufactured by West Chemical Products, Inc. Resilient tile laid on such treated floors appeared to be in perfect condition after periods of from one to three years. The particular product used was said to be a solution of chlorinated rubber in xylene.

3. COMMERCIAL CURING AND PARTING AGENTS

Table 1 is a list of manufacturers of curing and parting agents. Part of the list was obtained from Sweet's Architectural Catalog File for 1962 and part from a recent survey disclosed in a letter to Mr. Thomas H. Boone of the Bureau from Mr. C. B. Whittelsey, Jr., Managing Director, Asphalt and Vinyl Asbestos Tile Institute. Table 2 is a list of commercial curing and parting agents, compiled from the above sources, from manufacturers' sales literature and technical data and from representatives of the manufacturers. It cannot be too strongly emphasized that these tables are based solely on information from the manufacturers and that the National Bureau of Standards is not responsible for any errors or misinformation contained therein.

TABLE 1. MANUFACTURERS OF CURING AND PARTING AGENTS
(Materials are curing agents unless otherwise specified)

The Aquabar Company Commercial Trust Building Philadelphia 2, Pennsylvania	AQUABAR DURO-SEAL CONCRETE FLOOR TREATMENT
Brown & Brown P. O. Drawer 269 Mobile, Alabama	A-500
Calbar, Incorporated 2626 N. Martha Street Philadelphia 25, Pennsylvania	CRETE-SEAL
Ceresit Corporation 3227 S. Shields Avenue Chicago 16, Illinois	CEROSEAL, COLOCURE, INDURITE, LETS GO (parting agent), SURESEAL
Chemex Industries, Inc. P. O. Box 5072 Tampa, Florida	CLEAR-TREET
Concrete Service Company 2134 Cherry Street Philadelphia 3, Pennsylvania	C-H-S FLOOR TREATMENT, CURE-SEAL
Creto Company of America, Inc. 11613 South Western Avenue Los Angeles 47, California	CRETO

Dewey & Almy Chemical Division
W. R. Grace & Company
62 Whittemore Avenue
Cambridge 40, Massachusetts

DARAFILM

The Euclid Chemical Company
19218 Redwood Road
Cleveland 10, Ohio

EUCO FLOOR COAT, EUCO KUREZ

Guardian Chemical Company
708 Jefferson Street, N.W.
Atlanta 1, Georgia
Representative:
Thomas E. Turner
9218 Fisk Road
Richmond 29, Virginia

CLEAR BOND

A. C. Horn Companies
Sun Chemical Corporation
Building Materials Division East
2133 85th Street
North Bergen, New Jersey
Washington representative:
Mr. Lee Groff
JE4-3626

HORN CLEAR SEAL, HORN CURE CONCRETE
CURING COMPOUNDS

Hunt Process Company, Inc.
7012 Stanford Avenue
Los Angeles 1, California

HUNT PROCESS 112-TU

Imperial Chemical Company
1460 W. Hubbard Street
Chicago 22, Illinois

LIFT-A-PART (parting agent)

Johnson-March Corporation
3018 Market Street
Philadelphia 4, Pennsylvania

RITECURE CLEAR, RITECURE SPECIAL
RITECURE WP

Kedmont Waterproofing Company
53 W. Jackson Boulevard
Chicago 4, Illinois

PRESERVA-KURE-SEAL

Lambert Corporation
P. O. Box 151
Houston, Texas

LAMBCO CONCRETE CURE No. 64
RESIN BASE CONCRETE CURE No. 64RB
WHITE PIGMENTED CURE No. 64W
BITUMINOUS BLACK CURE No. 64B
NO-BOND CURE No. 64NB
(Curing and parting agent)

The Master Builders Co., Division of
American-Marietta Company
2490 Lee Boulevard
Cleveland 18, Ohio

MASTERKURE

Representative:

Mr. W. E. Teuscher
6229 N. Charles Street
Baltimore 12, Maryland
DRexel 7-7400

McMillan Products Division
The Hausman Steel Company
2411 Vinewood Avenue
Detroit 16, Michigan

DEMICON CURE-HARD

W. R. Meadows, Incorporated
2 - 18 Kemball Street
Elgin, Illinois

SEALTIGHT V-167-30, SEALTIGHT
GILSONITE BLACK ASPHALT, SEALTIGHT
CURE-HARD

Permiteco, Incorporated
1110 E. Monument Avenue
Dayton 2, Ohio

PERMITE V160

The Peters Company, Div.,
Toledo Paint & Chemical Company
33 Blucher Street
Toledo 1, Ohio

CURE-CRETE No. 200

Philadelphia Quartz Company
Public Ledger Building
Philadelphia 6, Pennsylvania

"O" SODIUM SILICATE

Presstite Division
American-Marietta Company
St. Louis 10, Missouri

TECHKOTE ANTI-BOND 200

Write to:

600 Lairport Street
El Segundo, California

Reardon Industries, Inc.
2837 Stanton Avenue
Cincinnati 6, Ohio

DUSCURE, SURE-CURE

Sika Chemical Corporation
35 Gregory Avenue
Passaic, New Jersey
Tidewater District Office,
Mr. Douglas Fox, District Manager
1221 Leadenhall Street
Baltimore, Maryland
Saratoga 7-3932

ANTISOL, SIKI HARDENER

Sonneborn Chemical and Refining Corp.
300 Park Avenue South
New York 10, New York
Building Products Division
Washington representative:
Mr. S. B. Rosenfeld
4953 St. Elmo Avenue
Washington, D. C.
OL2-2022, TA9-5045

HYDROCIDIC CURING COMPOUND RESIN X
KURE-N-SEAL

E. A. Thompson Company, Inc.
(formerly By-Chemical Products Co.)
Western Merchandise Mart
San Francisco 3, California

THOMPSON'S WATER SEAL

Toch Bros., Inc.
521 Fifth Avenue
New York 17, New York
Washington representative:
Mr. Tillson
4953 St. Elmo Avenue
Washington 14, D. C.
652-4141

RIW CURETOX LIQUID, FLINTOX LIQUID,
SEALKURE, TOXKURE

The Tremco Manufacturing Company
10701 Shaker Boulevard
Cleveland 4, Ohio

TREMCURETE

Tretol, Inc., Division of
Servicised Products Corporation
7252 West 66th Street
Chicago 38, Illinois

DEKOTE T130

Truscon Laboratories
Industrial Maintenance Division
Devoe & Raynolds Company, Inc.
1700 Caniff Street
Detroit 11, Michigan
P. O. Box 9263, Rosslyn Station
Arlington 9, Virginia
Sales representative:
Frank J. Hasse
RE7-2374

AGATEX, TRU-SEAL, TRU-CURE

The Upco Company
4801-17 Lexington Avenue
Cleveland 3, Ohio
Manufacturer's agent:
A. Albert Pack, Jr.
14800 Maydale Court
Silver Spring, Maryland
EVERgreen 4-9474

CURECOTE (CURECOAT), POLYCLEAR,
UPCO PARAFILM

Wall Products, Inc.
6 Honiss Street
Belleville 7, New Jersey
(See Tretol, Inc., parent company)

KLEARCURE #10 and #30

West Chemical Products, Inc.
42-16 West Street
Long Island City 1, New York
Washington representative:
Don E. Killgore
412 Fifth Street, N.W.
NA8-1820

WEST CONCRETE FLOOR TREATMENT
WESTCURE
WEST BOND BREAKER (Parting agent)

George W. Whiteside Company
31st and Michigan Drive
Louisville 12, Kentucky

AQUASTATIC CONCRETE CURING COMPOUND

TABLE 2.

CURING AND PARTING AGENTS, 6 April 1962.

(Materials are membrane-forming curing agents unless otherwise specified)

Trade Name	Manufacturer	Type	Compatible with	
			Paints	Floor Covering
A-500	Brown & Brown	Unknown	Unknown	Yes
AGATEX	Truscon Laboratories	Unknown	Unknown	Unknown
ANTI-BOND (TECHKOTE ANTI-BOND)	Sika Chemical Corp.	Unknown	Disintegrates	
ANTISOL	The Aquabar Company	Rubber Base	Unknown	Yes
AQUABAR DURO-SEAL	George W. Whiteside Co.	Resin Base	with non-aqueous adhesives	
AQUASTATIC CONCRETE CURING COMPOUND	Ceresit Corporation	Sodium silicate hardener	probably not	
CEROSEAL	Concrete Service Co.	Synthetic Rubber Base	Unknown	Yes
C-H-S FLOOR TREATMENT	Guardian Chemical Co.	Resin Base	Yes	Yes
CLEAR BOND				
CLEAR SEAL (HORN CLEAR SEAL)	Chemex Industries, Inc.	Unknown	Yes	Yes
CLEAR-TREET	Ceresit Corporation	Rubber Base	Unknown	Yes
COLOCURE	Greto Co. of America, Inc.	Unknown	Unknown	Unknown
CRETO	Calbar, Inc.	Probably Resin Base	Disintegrates	
CRETE-SEAL	The Upco Company	Resin and Wax Base	Disintegrates	
CURECOTE (CURECOAT)	The Peters Company	Contains no waxes	Yes	Yes
CURE-CRETE No. 200				
CURE-HARD (DEMICON CURE-HARD)	Concrete Service Co.	Synthetic Resin	Yes	Yes
CURE-SEAL				
CURETOX LIQUID				
(RTW CURETOX LIQUID)	Dewey & Almy	Resin and Wax Base	Must be removed	
DARAFILM	Tretol, Inc.	Resin Base	Unknown	
DEKOTE T130	McMillan Products Div.	Chlorinated Rubber Base	Yes	
DEMICON CURE-HARD		Sodium silicate hardener	Probably not	
DURO-SEAL (AQUABAR DURO-SEAL)				
DUSCURE	Reardon Industries, Inc.	Powder	Must be swept off	
EUCO FLOOR COAT	The Euclid Chemical Co.	Chlorinated rubber, Chlorinated resins, and plasticizers	Unknown	Yes

Compatible with				
Trade Name	Manufacturer	Type	Paints	Floor Coverings
EUCO FLOOR HARDENER CRYSTALS (OXALIN) EUCO KUREZ	The Euclid Chemical Co.	Resin Base Paraffin Base Wax-resin Base White pigmented (wax, resin, pigment)	Yes No No No	Yes No No No
FLINTOX LIQUID (RIW FLINTOX LIQUID) HORN CLEAR SEAL HORNCURE 30D and C	A. C. Horn Chemical Cos. A. C. Horn Chemical Cos.	Unknown 100% Resin Base	Yes Must be removed by floor machine	Yes Must be removed by floor machine
40W - White Pigmented Curing Compound 50D and C; 60D and C HUNT PROCESS #112-TU HYDROCID CURING COMPOUND RESIN X	Hunt Process Co., Inc. Sonneborn Chemical and Refining Corp.	Wax, Resin, Pigment Wax and Resin Base Unknown Plasticized Resin Base	No No Disintegrates Must wear off or be removed with stiff brush	No No Disintegrates Must wear off or be removed with stiff brush
INDURITE KLEARCURE #10 and #30 KUREZ (EUCO KUREZ) KURE-N-SEAL	Ceresit Corporation Wall Products, Inc. Sonneborn Chemical and Refining Corp. Lambert Corporation	Chemical hardener Mg + Zn fluosilicate Resin Base Chlorinated Rubber Base	Unknown Unknown Unknown Yes	Unknown Unknown Unknown Yes
LAMBEO BITUMINOUS BLACK CURE No. 64B CONCRETE CURE No. 64 NO-BOND CURE No. 64NB (Curing and Parting Agent) RESIN BASE CONCRETE CURE No. 64RB WHITE PIGMENTED CURE No. 64W	Ceresit Corporation	Asphalt Basé and organ- ic solvent Wax and Resin Base Probably wax and Resin Base - Unknown Resin Base Wax, Resin, and Pigment Base Wax-free	For asphalt coatings or adhesives Disintegrates Disintegrates Disintegrates Yes Disintegrates Must be removed by washing	For asphalt coatings or adhesives Disintegrates Disintegrates Disintegrates Yes Disintegrates Must be removed by washing
LETS GO (parting agent)	Ceresit Corporation			

Compatible with

<u>Trade Name</u>	<u>Manufacturer</u>	<u>Type</u>	<u>Paints</u>	<u>Floor Coverings</u>
LIFT-A-PART (parting agent)	Imperial Chemical Co.	Unknown		Must be removed
MASTERKURE	The Master Builders Co.	Resin Base		Not recommended
"O" SODIUM SILICATE	Philadelphia Quartz Co.	Sodium silicate hardener		Probably not
OXALIN	The Euclid Chemical Co.	Unknown		Unknown
PARAFILM (UPCO PARAFILM)				
PERMITE VI60	Permiteco, Inc.	Unknown		Unknown
POLYCLEAR	The Upco Company	Resin and Plasticizer	Yes	Yes
PRESERVA-KURE SEAL	Kedmont Waterproofing Co.	Synthetic Resin Base		Unknown
RESIN X (HYDROCID CURING COMPOUND RESIN X)				
RITECURE CLEAR	Johnson-March Corp.	No wax	Unknown	Yes
SPECIAL		No wax	Unknown	Yes
WP		No wax	Unknown	Yes
RIW CURETOX LIQUID	Toch Bros., Inc.	Unknown Membrane Curing Compound	Unknown	Yes
FLINTOX LIQUID		Chemical Hardener containing "Fluorox"		Unknown
SEALKURE		Chlorinated Rubber Base	Unknown	Yes
TOKKURE		Unknown	Unknown	Unknown
SEALKURE (RIW SEALKURE)	W. R. Meadows Co.	Sodium silicate hardener		Probably not
SEALTIGHT CURE-HARD		Asphaltic curing compound	For asphalt coatings	
GILSONITE BLACK ASPHALT		100% Resin Base		Unknown
VI67-30		Fluosilicate hardener		Unknown
SIKA HARDENER	Sika Chemical Corp.	Pure Resin	Unknown	Yes
SURE-CURE	Reardon Industries, Inc.	Pure Resin		Must be removed
SURESEAL	Ceresit Corp.	Wax Resin		Probably not
TECHKOTE ANTI-BOND	Presstite Div.	White pigmented wax-resin		Probably not
THOMPSON'S WATER SEAL (curing and parting agent)	E. A. Thompson Co., Inc.	Wax-free	Yes	Yes
TOKKURE (RIW TOKKURE)		Unknown	Probably not although claimed to be	
TREMCRETE	The Tremco Mfg. Co.	Chlorinated natural rubber, alkyd-type resin, and plasticizer	Unknown	If mastic does not contain a solvent which softens the Tremcrete film
TRUCURE	Truscon Laboratories	Unknown	No	No

<u>Trade Name</u>	<u>Manufacturer</u>	<u>Type</u>	<u>Compatible with</u>	
			<u>Paints</u>	<u>Floor Coverings</u>
TRU-SEAL	Truscon Laboratories The Upco Company	Unknown Rubber Base	Yes	Yes
UPCO PARAFILM			Unknown	Unknown
WATER SEAL (THOMPSON'S WATER SEAL)	West Chemical Products, Inc. West Chemical Products, Inc.	No waxes or silicones Chlorinated rubber in xylene	Probably not	Probably not
WEST BOND BREAKER (parting agent)			Yes	Yes
WEST CONCRETE FLOOR TREATMENT	West Chemical Products, Inc.	Plasticized resin base		
WESTCURE			Yes	Yes

While the information in Table 2 is incomplete, a study of this table leads to Tables 3, 4, 5 and 6.

TABLE 3. MEMBRANE CURING AGENTS COMPATIBLE WITH PAINTS, WITHOUT REMOVAL

Chlorinated rubber base materials: KURE-N-SEAL, WEST CONCRETE FLOOR TREATMENT.

Resin base materials: CLEAR BOND, CURE-SEAL, EUCO KUREZ, LAMBCO RESIN BASE CONCRETE CURE No. 64RB, POLYCLEAR, WESTCURE

Composition not revealed by manufacturer ("unknown"): CLEAR-TREET, CURE-CRETE (contains no waxes), HORN CLEAR SEAL, TECHKOTE ANTI-BOND (contains no waxes), TRU-SEAL.

TABLE 4. MEMBRANE CURING AGENTS COMPATIBLE WITH RESILIENT FLOOR COVERING WITHOUT REMOVAL.

Chlorinated rubber base: AQUABAR DURO-SEAL, C-H-S FLOOR TREATMENT, KURE-N-SEAL, RIW SEALKURE, and WEST CONCRETE FLOOR TREATMENT

Resin base: CLEAR BOND, CURE-SEAL, EUCO KUREZ, LAMBCO RESIN BASE CONCRETE CURE No. 64RB, POLYCLEAR, SURE-CURE, and WESTCURE

Composition not revealed by manufacturer ("unknown"): CLEAR-TREET, CURE-CRETE No. 200 (contains no waxes), HORN CLEAR SEAL, RITECURE CLEAR, SPECIAL, and WP (contains no waxes), TECHKOTE ANTI-BOND (contains no waxes), and TRU-SEAL.

TABLE 5. MEMBRANE CURING AGENTS NOT COMPATIBLE WITH PAINTS OR WITH RESILIENT FLOOR COVERINGS.

Paraffin base: EUCO KUREZ (paraffin base)

Wax-resin base: EUCO KUREZ (wax-resin or white pigmented base), HORNCURE 40W, 50D and C, 60D and C

TABLE 6. MEMBRANE CURING AGENTS WHICH DISINTEGRATE OR WHICH MUST BE REMOVED BEFORE
APPLYING PAINTS OR RESILIENT FLOOR COVERINGS.

Resin base: CRETE-SEAL, HORNCURE 30D and C, HYDROCID CURING COMPOUND
RESIN X

Wax-resin base: CURECOTE, DARAFILM, LAMBCO CONCRETE CURE No. 64,
LAMBCO WHITE PIGMENTED CURE No. 64W, SURESEAL

4. CONCLUSIONS

From the information obtained from the manufacturers of curing and parting compounds, it seems obvious that paints and resilient floor coverings cannot be applied over any such compounds which contain waxes. However, it is claimed that some wax-resin compositions will disintegrate or can be removed without sandblasting or grinding. Some resin base curing agents are compatible with paints and resilient floor coverings and some are not. Chlorinated rubber base membrane curing compounds appear to be satisfactory as a base for paints or resilient floor coverings.

The compatibility of chlorinated rubber base membrane curing agents with paints and resilient tile is corroborated by the inspection of buildings mentioned earlier in this report and also on information from the Research and Development Laboratories of Armstrong Cork Company. Armstrong Cork Company also have observed the incompatibility of agents containing waxes. However, according to adhesion tests by Armstrong Cork Company, asphaltic adhesives can be used with any type of curing compound.

U. S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

NATIONAL BUREAU OF STANDARDS
A. V. Astin, *Director*



THE NATIONAL BUREAU OF STANDARDS

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Office of Weights and Measures.

BOULDER, COLO.

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Radio Standards. High Frequency Electrical Standards. Radio Broadcast Service. Radio and Microwave Materials. Atomic Frequency and Time Interval Standards. Electronic Calibration Center. Millimeter-Wave Research. Microwave Circuit Standards.

Radio Systems. Applied Electromagnetic Theory. High Frequency and Very High Frequency Research. Modulation Research. Antenna Research. Navigation Systems.

Upper Atmosphere and Space Physics. Upper Atmosphere and Plasma Physics. Ionosphere and Exosphere Scatter. Airglow and Aurora. Ionospheric Radio Astronomy.

